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SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC ASD Spec	(1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design
AISC Pub No. S303	(1992) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6/A 6M	(1998a) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 354	(1998) Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
ASTM A 490	(1997) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM A 563	(1997) Carbon and Alloy Steel Nuts
ASTM A 709/A 709M	(1997a) Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges
ASTM F 436	(1993) Hardened Steel Washers

ASME INTERNATIONAL (ASME)

ASME B46.1 (1995) Surface Texture (Surface Roughness, Waviness, and Lay)

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1998) Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS D1.5 (1996) Bridge Welding Code

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Manual (1999) Manual for Railway Engineering (4 Vol.)

1.2 GENERAL REQUIREMENTS

Structural steel fabrication and erection shall be performed by an organization experienced in structural steel work of equivalent magnitude. The fabricator shall be certified under the AISC Quality Certification Program, Category III, Major Steel Bridges. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. The design, fabrication, erection and construction shall be performed in accordance with AREMA Manual Chapter 15.

1.2.1 Shop Inspection

Shop inspection is required for all shop-fabricated items. The Contractor shall arrange and pay for shop inspection services by an approved independent testing agency.

1.2.2 Shop Welding

Shop welding shall be performed in accordance with AWS D1.5 as amended and complimented by AREMA Manual Chapter 15. AREMA Manual Chapter 15 shall take precedence over AWS D1.5.

1.2.3 Fracture Control Plan

The Contractor shall follow the Fracture Control Plan for Fracture Critical members per AREMA Manual Chapter 15, Section 1.14.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Structural Steel System; FIO. Structural Connections; FIO. Weld Procedures ; FIO.

Shop and erection details including members (with their connections) not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.

SD-08 Statements

Erection; FIO.

Erection plan of the structural steel framing is required. Erection plan shall conform to the requirements of AISC Pub No. S303, shall be submitted prior to erection, and shall describe all necessary temporary supports, including the sequence of installation and removal. Quality Control Program shall list methods and personnel to satisfy the requirements of AREMA Manual Chapter 15 and AWS D1.5.

SD-13 Certificates

Mill Test Reports; FIO.

Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items

Welder, Welder Operator and Tacker Qualifications; FIO. Inspector Qualifications; FIO.

Certified copies of welder, welder operator, tacker and inspector qualification test records showing qualification in accordance with AREMA Manual Chapter 15 and AWS D1.5.

Fabrication; FIO.

A copy of the AISC certificate indicating that the fabrication plant meets the specified structural steelwork category.

SD-14 Samples

High Strength Bolts and Nuts; FIO. Carbon Steel Bolts and Nuts; FIO. Nuts Dimensional Style; FIO. Washers; FIO.

Random samples of bolts, nuts, and washers as delivered to the job site if requested, taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

All structural steel shall conform to ASTM A 709/A 709M Grade 50W unless otherwise specified on the plans. No painting is necessary.

2.1.1 FRACTURE CRITICAL MEMBERS

Structural steel denoted on the plans as "Fracture Critical Members" and its fabrication shall meet the requirements of AREMA Manual Chapter 15, Section 1.14, and shall conform to ASTM A 709/A 709M Grade SOWF2. Notch Toughness Requirements and Testing shall be based on a minimum service temperature of -30 degrees F.

2.1.2 IMPACT TESTED STRUCTURAL MEMBERS

Structural steel denoted on the plans as "Impact Test Required" shall conform to ASTM A 709/A 709M, Grade 50WT2. Notch toughness requirements and testing shall be based on a minimum service temperature of -30 degrees F.

2.2 HIGH STRENGTH BOLTS AND NUTS

All high strength bolts shall be heavy hex head structural bolts with heavy hex style nuts and hardened washers under the turned element. Bolts shall be tightened by the turn of nut method to obtain proper tension. Nuts shall be carbon steel nuts conforming to ASTM A 563, Grade DH3

2.2.1 Fasteners

All fasteners shall be 7/8 inch diameter high strength bolts conforming to ASTM A 490, Type 3 with 15/16 inch open holes unless otherwise noted.

2.2.2 Deck Bolts

All deck bolts connecting ballast deck pan to floor beam shall be 3/4 inch diameter high strength bolts conforming to ASTM A 325, Type 3, or 3/4 inch diameter C50L Huckbolt fasteners, with 15/16 inch open holes unless otherwise noted.

2.2.3 Anchor Bolts

All anchor bolts for bearing devices shall conform to ASTM A 354, Grade BD. Anchor bolts, nuts and plate washers shall be hot-dipped galvanized in accordance with ASTM A 153/A 153M.

2.3 WASHERS

Plain washers shall conform to ASTM F 436, Grade 3 unless otherwise specified on the plans.

2.4 FILLER METAL

Filler metal for welding shall conform to AWS D1.5 with minimum tensile strength of 70 ksi and atmospheric corrosion resistance and coloring characteristics similar to that of the base metal.

2.5 WELDING EQUIPMENT AND MATERIALS

All welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.5. Welding rods shall have the same weathering characteristics as the base steel. Weldability of materials shall be consistent with Appendix X3 of ASTM A 6/A 6M.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC Spec, Specification for Structural Steel Buildings. All fabrication and assembly shall be done in the shop. The fabricating plant shall be certified under the AISC Quality Certification Program for Category III structural steelwork.

3.1.1 Straightening Material

Rolled materials, before being laid out or worked shall be straight. Subassemblies and completed members shall be straight before being incorporated into the work. If straightening is necessary, it shall be done by methods acceptable to the Contracting officer. Details for methods proposed for straightening shall be submitted in writing to the Contracting officer prior to their use. After straightening, evidence of fracture or other damage will be cause for rejection of the material. The top surface of floor beams in the through girder span shall be adjusted as needed to form a level line at any longitudinal section within a tolerance of $\pm 1/8$ inch.

3.1.2 Mechanical Cutting

Exposed corners on plate cut edges shall be rounded to $1/16$ inch radius, or equivalent flat surface at a suitable angle.

3.1.3 Facing and Bearing Surfaces

Compression joints depending on contract bearing shall have a surface roughness not in excess of 500 micro inches as determined by ASME B46.1. and ends shall be square within the tolerances for milled ends specified in ASTM A 6/A 6M. Surfaces of bearing that are to come into contact with each other shall be flat to within $1/32$ of an inch in 12 inches and to within $1/16$ of an inch tolerance overall.

3.1.4 Fit of Stiffeners

Local clearances between the end of the stiffener and the girder flange shall not exceed $1/16$ of an inch.

3.1.5 Punching

Punching or sub-punching of structural steel where the material is thicker than 7/8 inch will not be permitted. The diameter of the die for punching shall not exceed that of the punch by more than 3/32 of an inch. Holes subpunched for reaming shall be subpunched 1/4 of an inch less in diameter than that of the finished hole.

3.1.6 Bolt Holes

Bolt holes shall be standard holes unless otherwise noted on the plans.

3.2 ERECTION

Erection of structural steel shall be in accordance with the applicable provisions of AISC ASD Spec.

3.2.1 Preassembly

Completed subassemblies for structures or units of structures shall be preassembled prior to erection as necessary to verify the geometry of the complete structure or unit and to verify or prepare field connections as specified herein.

3.2.2 Concrete Connections

3.2.2.1 Anchor Bolts

Anchor bolts shall be installed as indicated to a tolerance of 1/8 inch. The distance between any two bolts shall not deviate by more than 1/8 inch from that indicated. Special care shall be taken not to damage the anchor bolt threads during assembly.

3.2.2.2 Bearing Pads

The bearing pads shall be set parallel to the girder sole plate at the elevations indicated on the plans.

3.2.3 Bolted Connections

All connections made with high-strength bolts shall be tensioned according to AREMA Manual Chapter 15, whether classified as slip critical or bearing type connections. Nuts shall be located, wherever practical, on the side of the member that will not be visible from the traveled way. Surfaces shall be clean mill scale, free of oil, paint, lacquer or other coatings and loose oxides.

3.2.4 Tension Calibration Device

The Contractor shall provide a tension calibration device on site to check power wrenches or a calibrated manual torque wrench. Equipment shall be tested in the presence of the Contracting Officer. Bolts may be tightened to the required tension by use of the turn of nut method, or by tightening and using direct tension indicators. Bolt tension shall be checked at locations selected by the Contracting Officer.

3.3 SHOP INSPECTION

Shop inspection is required for all shop-fabricated items. The Contractor shall arrange and pay for shop inspection services by an approved independent testing agency.

3.4 WELDING OPERATIONS

3.4.1 Requirements

Workmanship and techniques for welded construction shall conform to the requirements of AWS D1.5 and AISC ASD Spec. When AWS D1.5 and the AISC ASD Spec specification conflict, the requirements of AWS D1.5 shall govern.

3.4.2 Identification

Welds shall be identified in one of the following ways:

- a. Written records shall be submitted to indicate the location of welds made by each welder, welding operator, or tacker.
- b. Each welder, welding operator, or tacker shall be assigned a number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. For seam welds, the identification mark shall be adjacent to the weld at 3-foot intervals. Identification with die stamps or electric etchers shall not be allowed.

3.5 TESTING

3.5.1 Quality Control Program

The fabricator shall provide a quality control program which includes the visual and nondestructive inspection of welds in accordance with the requirements of AREMA Manual Chapter 15, AWS D1.5 Section 6, "Inspection" and this specification.

3.5.2 Documentation

The fabricator shall maintain documentation of all visual inspection and nondestructive testing for the Contracting Officer, and shall turn over such documentation upon completion of fabrication.

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DIVISION 05 - METALS

SECTION 05200

ELASTOMERIC BEARING PADS

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SECTION 05200

ELASTOMERIC BEARING PADS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 570	(1998) Steel Sheet and Strip, Carbon, Hot Rolled, Structural Quality
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D 395	(1998) Standard Test Methods for Rubber Property-Compression Set
ASTM D 412	(1998a) Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
ASTM D 573	(1988; R 1994) Standard Test Method for Rubber-Deterioration in an Air Oven
ASTM D 624	(1991; R 19998) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 740	(1994; R 1997) Methyl Ethyl Ketone
ASTM D 1149	(1999) Standard Test Method for Rubber Deterioration-Surface Ozone Cracking in a Chamber
ASTM D 2137	(1994) Standard Test Methods for Rubber Property-Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D 2240	(1997) Standard Test Method for Rubber Property-Durometer Hardness
ASTM D 3190	(1995) Standard Test Method for Rubber Evaluation of Chloroprene Rubber (CR)

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION

(AREMA)

AREMA Manual

(1999) Manual for Railway Engineering (4
Vol.)

1.2 GENERAL REQUIREMENTS

Elastomeric bearing pads consist of alternating laminations of elastomer and steel sheet bonded together. Bearing pads shall be manufactured and installed in accordance with AREMA Manual, Chapter 19 and these specifications.

1.2.1 Certification

The bearing pad supplier shall certify that the elastomer, and steel sheets if used, in the bearing pads that are furnished for each order conform to all of the requirements of Paragraphs 2.1 and 2.2.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Materials; FIO.

Certified copy of the results of tests performed by the manufacturer upon samples of the elastomer and steel sheets that were used in the bearing pads.

1.4 STORAGE

Material shall be stored in accordance with manufacturer's recommendations..

PART 2 PRODUCTS

2.1 ELASTOMER

The elastomer for bearing pads shall be formulated from previously unvulcanized 100 percent virgin polychloroprene (neoprene) and shall, as determined from test specimens prepared in accordance with ASTM D 3190, conform to the following:

<u>ASTM</u> <u>Requirement</u>	<u>Test</u>	
ASTM D 2240 5	Hardness, Type A Durometer	60 +/-
ASTM D 412 17	Minimum Tensile Strength in Mpa	
	Minimum Elongation at break, %	

350		
ASTM D 573	Heat Resistance, Oven Aged 70 hrs at 100 deg. C.	
	Change in durometer hardness, max. points	0 to
+15		
	Change in tensile strength, max. %	
-15		
	Change in ultimate elongation, max.	
-40		
ASTM D 395	Compression Set, 22 hrs. at 70 deg. C.,	
	Method B, max. %	
25		
ASTM D 1149	Ozone Resistance, 1 ppm in Air by volume,	
	20% strain, 40 +/- 1 deg. C., mounting	
	procedure D 518 Procedure A	No cracks
after		
		100 hrs.
exposure		
ASTM D 2137	Low Temperature Brittleness, at -40 deg. C.	
Pass		
ASTM D 624	Tear Resistance, Die "C", min. N/m	
43,775		

2.2 STEEL SHEETS

Steel sheets for use in laminated bearing pads shall meet the requirements of ASTM A 570, Grade 36.

2.3 METHYL ETHYL KETONE

Methyl ethyl ketone for use in cleaning of elastomeric bearing pads shall meet the requirements of ASTM D 740, Type 1 or Type 2.

2.4 GEL TYPE EPOXY

The gel type epoxy shall be a two component, epoxy-resin bonding system conforming to the requirements of ASTM C 881, Type IV, Grade 2, Class B or C. The class supplied shall be governed by the range of temperatures for which the material is to be used.

2.5 LAMINATED BEARING PADS

- a. Laminated bearing pads shall have alternate layers of elastomer and steel sheets as shown on the design drawings, and shall be cast in individual molds under heat and pressure to form an integral unit of such construction that the bearing pad cannot be separated by any mechanical means into separate, definite and well-defined elastomeric layers. Evidence of layered construction shall be cause for rejection.
- b. The top and bottom steel sheets and the edges of all steel sheets shall be uniformly covered with not less than 1/8 inch of elastomer. The maximum cover of elastomer over the edges of steel sheets shall be 1/4 inch. Steel sheets shall be abrasive blast cleaned to remove all rust, mill scale, and other contaminants, and shall be free of sharp edges and burrs.

PART 3 EXECUTION

3.1 TOLERANCES

For both plain and laminated bearing pads the permissible variation from the dimensions and configuration required by the plans and these specifications shall be as follows:

1. overall vertical dimensions
Average total thickness 1-1/2" or less -0, +1/8"
Average total thickness over 1-1/2" -0, +1/4"
2. overall horizontal dimensions -0, +1/4"
3. Thickness of individual layers of elastomer
(laminated bearing pads only) +/- 1/8"
4. Variation from a plane parallel to the theoretical surface
Top 1/8"
Sides 1/4"
Individual Steel Sheets 1/8"
5. Size of holes or slots -0, +1/8"
6. Position of holes or slots +/- 1/8"

3.2 INSTALLATION

a. Elastomeric bearing pads shall be installed in accordance with the plans. Substructure bearing surfaces to receive the bearing shall be level, smooth, and finished to the correct elevation. The entire bearing surface shall be fully loaded under all conditions.

b. Top and bottom elastomer surfaces shall be level under dead load only. Tapered load plates bonded to the bearing, tapered sole plates on the bridge span, or epoxy mortar between the bearing and the bridge span, as specified on the plans, shall compensate for span grade, rotation, or camber.

c. Welding of bridge span members to the bearing load plate is not permitted unless there is more than 1-1/2 inches of steel between the weld and the elastomer. The temperature of the steel plate in contact with the elastomer shall not exceed 400 degrees F during the welding process.

d. Bearing areas on bridge seats and precast concrete beams, which are to receive epoxy materials, shall be abrasive blast cleaned to remove all form oil and curing agents and shall be in a dust free condition. Bearing areas on steel bearing plates, which are to receive epoxy materials, shall be cleaned of all dirt, grease, and other contaminants before epoxy materials are applied.

e. Clean top and bottom surfaces of bearing pads with methyl ethyl ketone to remove all traces of mold release agents. when mating surfaces are clean

and dry, gel type epoxy as specified in Paragraph 2.4 shall be applied to a 5 mil thickness on the areas of the bridge seat where elastomeric bearing pads are to be placed, and on the bottom side of the elastomeric bearing pads and then the pads shall be set and held in the proper location on the bridge seat until the epoxy takes its initial set. Pads must be held down with sufficient weight to ensure total pad contact on the bridge seat.

f. When epoxy mortar is specified to compensate for span, grade, rotation, or camber, mortar consisting of equal parts by volume of gel type epoxy as specified in Paragraph 2.4.A and dry silica sand, mixed in accordance with manufacturer's directions, shall be spread on top of bearing pads to a thickness of approximately 1/8 inch just before setting beams in order to obtain uniform bearing. The beams shall be set in the proper location on the bearing pads before the epoxy mortar takes its initial set. Scrape excess mortar from around bearing pads after beams are set.

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SECTION 05500

MISCELLANEOUS METAL

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SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1996) Carbon Structural Steel
ASTM A 53	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 123/A 123M	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 307	(1997) Carbon Steel Bolts and Studs, 60 ksi Tensile Strength
ASTM A 924/A 924M	(1996a) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1994) Structural Welding Code - Steel
AWS D1.5	(1996) Bridge Welding Code

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Manual	(1999) Manual for Railway Engineering (4 Vol.)
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1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Miscellaneous Metal Items; FIO.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates.

SD-13 Certificates

Welder Qualifications; FIO.

Certified copies of welder qualifications test records showing qualification in accordance with AREMA Manual Chapter 15 and AWS D1.5.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.5. All other welding shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

PART 2 PRODUCTS

2.1 STEEL HANDRAILS

Steel handrails, including inserts in concrete, shall conform to the requirements of ASTM A 53, Type E or S, Grade A, standard weight. Steel railings shall be 2-inch nominal size. Railings and pipe collars shall be hot-dip galvanized in accordance with ASTM A 123/A 123M.

Jointing shall be fabricated by one of the following methods:

- (a) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8 inch hexagonal recessed head setscrews.
- (b) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.

2.2 MISCELLANEOUS

Miscellaneous metal shall conform to ASTM A 36/A 36M unless noted otherwise. Miscellaneous fasteners shall conform to ASTM A 307 unless noted otherwise.

2.3 STEEL PIPE

Steel pipe shall be zinc-coated (galvanized) steel pipe conforming to the requirements of ASTM A 53.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations.

3.2 INSTALLATION OF STEEL HANDRAIL

Post installation shall be by grouting pipe post into preformed or drilled holes in the concrete walls. Grout mixture for grouting pipe post into concrete shall be as specified in SECTION 03307 CONCRETE FOR MINOR STRUCTURES.

-- End of Section --